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Three-dimensional multi-physics analysis and commissioning frequency tuning strategy of a radio-frequency quadrupole accelerator

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1 **Three-dimensional multi-physics analysis and commissioning frequency tuning strategy**
2 **of a radio-frequency quadrupole accelerator**

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7
8 Abstract

9 The resonant frequency stability of the radio frequency quadrupole (RFQ) is an important
10 concern during commissioning. The power dissipated on the RFQ internal surface will heat
11 the cavity and lead to a temperature rise and a structural deformation, especially in the
12 continuous wave (CW) RFQs, which will cause the resonant frequency shifts. It is important
13 to simulate the temperature rise, the deformation and the frequency shift of the RFQ cavity.
14 The cooling water takes away the power to maintain the frequency stability. Meanwhile, the
15 RFQ resonant frequency can be tuned by adjusting the water temperature. In this paper, a
16 detailed three-dimensional multi-physics analysis of the Low Energy Accelerator Facility
17 (LEAF) RFQ will be presented and a commissioning frequency tuning strategy will be
18 studied.

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